

WHAT IS CLAIMED IS:

1. A zoom lens in/from which a magnification changing optical unit for changing an overall focal length of said zoom lens can be inserted/removed,

5 wherein a wobbling unit which can be slightly amplitude-driven in an optical axis direction to detect a best imaging position is placed closer to an image side than an insertion position of said magnification changing optical unit.

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2. A lens according to claim 1, wherein said zoom lens sequentially includes, from an object side, a first unit which is fixed in magnification changing operation and has a positive refractive power, a second
15 unit which moves in the optical axis direction in magnification changing operation and has a negative refractive power, a third unit for correcting an image plane fluctuation accompanying magnification changing operation, and a fourth unit having a positive
20 refractive power for imaging, and a magnification changing optical unit which changes the overall focal length of said zoom lens can be inserted/removed in/from said fourth unit.

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3. A lens according to claim 2, wherein a light amount adjustment stop is placed closer to the object side than said fourth unit.

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4. A lens according to claim 3, wherein when said wobbling unit is placed in said fourth unit and amplitude-driven to make an amplitude halfwidth of a backfocus change amount become 1/2 a depth of focus,

5 $|\alpha_1(S_1 - E_1)/fw_1| < 0.6$

is satisfied, where α_1 is an angle of an off-axis sub-principal ray incident on an object-side principal plane of said wobbling unit (without insertion of said magnification changing optical unit), S_1 is a distance
10 to a stop viewed from the object-side principal plane of said wobbling unit (without insertion of said magnification changing optical unit), E_1 is a distance to an image pickup plane viewed from an image-side principal plane of said wobbling unit (without
15 insertion of said magnification changing optical unit), and fw_1 is a focal length at a wide-angle end without insertion of said magnification changing optical unit.

5. A lens according to claim 4, wherein when said wobbling unit is placed in said fourth unit
20 amplitude-driven to make an amplitude halfwidth of a backfocus change amount become 1/2 a depth of focus,

$|\alpha_2(S_2 - E_2)/fw_2| < 2.2$
is satisfied, where α_2 is an angle of an off-axis sub-principal ray incident on the object-side principal
25 plane of said wobbling unit (with insertion of said magnification changing optical unit), S_2 is a distance

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to the stop viewed from the object-side principal plane
of said wobbling unit (with insertion of said
magnification changing optical unit), E2 is a distance
to the image pickup plane viewed from the image-side
principal plane of said wobbling unit (with insertion
of said magnification changing optical unit), and fw2
is a focal length at the wide-angle end with insertion
of said magnification changing optical unit.

6. A lens according to claim 1, wherein in said
fourth unit,

$$-0.001 < \phi 4b / I_m < 0.0015$$

is satisfied, where $\phi 4b$ is a refractive power of a lens
unit located immediately before said wobbling unit in
said fourth unit, and I_m is an image size of an image
pickup element.

7. A lens according to claim 1, wherein said
wobbling unit is placed closest to the image side in
said fourth unit.

8. A lens according to claim 1, wherein part of
said fourth unit is retracted on the optical axis by
inserting said magnification changing optical unit.

9. A lens according to claim 1, wherein an
optical system for macro photographing and flange-back

adjustment is placed closer to the image side than said wobbling unit in said fourth unit, and said optical system can integrally move in macro photographing and flange-back adjustment.

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10. A lens according to claim 1, wherein an optical system for macro photographing and flange-back adjustment is placed closer to the image side than said wobbling unit in said fourth unit, and said optical system comprises a lens unit fixed in macro photographing and flange-back adjustment and a lens unit which can move in macro photographing and flange-back adjustment.

11. A lens according to claim 1, wherein an amplitude halfwidth of the wobbling unit before/after insertion of said magnification changing optical unit is

$$\Delta x_2 = F \cdot \Delta x_1$$

where Δx_1 is an amplitude halfwidth of the wobbling unit before insertion of the magnification changing optical unit, Δx_2 is an amplitude halfwidth of the wobbling unit after insertion of the magnification changing optical unit, and F is a rate of change of F-number due to insertion/removal of the magnification changing optical unit.

12. A photographing system comprising said zoom lens defined in claim 1 and a camera on which said zoom lens is mounted.

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